REMARKS

Favorable reconsideration of this application is requested in view of the foregoing amendments and the following remarks. Claims 1-3, 6-17 and 20-30 are pending in the application. Claims 3-4, 18-19 and 31-41 are canceled without prejudice or disclaimer.

The claims are thoroughly amended in order to more clearly define the invention, support for which is found in the figures and related parts of the specification. Claim 1 is amended to recite the limitations of original claim 4. Support for the recitation of a mid-span extender unit is found, for instance, at page 11, line 16 and at page 13, line 9 of the specification as originally filed. In claim 12-15, support for the recitation of the state variables corresponding to the time intervals is found at page 24 of the specification as originally filed. Claim 22 is amended to recite some of the limitations of original claim 25. Claims 23 and 24 are rewritten in independent form and are, therefore, not narrowed.

The specification is amended to recite the serial numbers of three incorporated by reference US utility applications together with their current status. The title is amended to more accurately name the claimed invention. The abstract is amended to more accurately summarize the claimed invention.

At page 2 of the Action, the Examiner objects to the drawings. Applicant submits herewith one copy of seven (7) sheet(s) of formal drawings that overcome the objection to the drawings as set forth by the Examiner by depicting clearer labels in Figs. 8 and 9. Applicant requests that the Examiner approve the substitute formal drawings and withdraw the objection to the drawings.

Accordingly, withdrawal of this objection is respectfully requested.

At page 2 of the Action, the Examiner objects to informalities in the specification. The specification has been amended to obviate the informalities by reciting the serial numbers of three incorporated by reference US utility applications together with their current status.

Accordingly, withdrawal of this objection is respectfully requested.

At page 2 of the Action, the Examiner objects to claim 1. Claim 1 is amended as suggested by the Examiner.

Accordingly, withdrawal of this objection is respectfully requested.

Claims 8-10 stand rejected under 35 USC 112(1) as nonenabled based on the above-discussed objection to the specification as nonenabling. This rejection is untenable.

Referring to page 21, line 23 to page 22, line 14, the specification does in fact clearly describe the notion of discrete gain levels. At page 22, lines 12-13, it is clearly described that "The gain-varying capability may be either continuous or **discrete**, but in any case should not introduce excessive distortion" (emphasis added). At page 22, line 10 a "gain step" is described which means that there are discrete values for gain. At page 21, line 27, "gain steps" are similarly described.

Accordingly, withdrawal of this rejection is respectfully requested.

Claims 12-15, 20-21 and 25 stand rejected under 35 USC 112(2) as indefinite.

With regard to claims 12-15, claim 12 is amended to explicitly define the corresponding state variables of Tnormal, Tshutdown, Tsleep, and Tdead., support for which is found at page 24 of the specification as originally filed. Claims 13-15 are amended to explicitly define the corresponding state variables of Tdead, Tup, and Tdown, respectively, support for which is found at page 24 of the specification as originally filed.

With regard to claims 20-21, claim 20 is amended to provide antecedent for the phrases noted by the Examiner. Claim 21 depends from claim 20.

With regard to claim 25, claim 25 is amended to obviate the lack of antecedent.

Accordingly, withdrawal of this rejection is respectfully requested.

Claims 1-7, 11 and 16-17 were rejected under 35 USC 102(b) as anticipated by Lemson (US 5,678,198). The Lemson reference teaches approaches to two primary problems:

a) In transmission circuits the effect of non-linearities is "magnified" if the signal power is higher than some nominal value. This is often called *intermodulation distortion*. A similar situation exists with analog-to-digital converters. It is preferable that the (maximum) analog input voltage to an analog-to-digital converter "line up" with the maximum expected voltage which is a function of the reference voltage, V_{AD}.

b) A/D and D/A converters have "sweet-spots" for their reference voltages. Thus it is advantageous to do an analog-to-digital conversion using V_{AD} as the reference and the digital-to-analog conversion using V_{DA} as the reference. If the two references are different, then viewed from an analog-to-analog perspective it appears that there is an effective voltage gain of (V_{DA}/V_{AD}).

The manner in which Lemson solves these problems is to ascertain the RF signal level (see 42 in Fig. 1 of Lemson, for example) and then control an amplifier (32) such that the resulting signal level is appropriate, for example as the input to an analog-to-digital converter (64). It is possible that the "gain" introduced by 32 is actually an attenuation (reduction in signal power).

However, the gain value utilized by 32 of Lemson is made known to the distant end. Only at the distant end of Lemson is the gain value of Lemson utilized. This is done in Lemson by modulating the control (i.e. gain) information onto a carrier (by 52) and combining it with the signal using 48. At the distant end this is demodulated by 27 and the appropriate gain (typically the reciprocal of that employed in 32) is fed to gain-control amplifier 35. Please see Lemson, col. 2, lines 7-9: "The system is configured to transmit a feedforward control signal over transmission link 22 to control a second signal level changing device 34."

In sharp contrast to Lemson, the claimed invention utilizes the determined gain at the mid-span extender unit that itself determines the gain. According to the invention as presently claimed, the mid-span extender unit must autonomously determine the appropriate gain.

Therefore, the claimed invention has the advantage of not relying on a transmitter ascertaining the appropriate gain required at the mid-span extender unit. Thus, the Lemson transmission of the gain value to the distant end of Lemson actual teaches away from the presently claimed invention.

Independent claim 1 as amended requires "controlling a first gain of said first variable gain amplifier at said mid-span extender unit responsive to said gain control signal; and controlling a second gain of a second variable gain amplifier at said mid-span extender unit responsive to said gain control signal to produce an output signal in a second direction from said second variable gain amplifier at said mid-span extender unit responsive to a second input signal in said second direction from said digital subscriber loop. The presently claimed invention is not disclosed or suggested by Lemson because Lemson does not describe or teach determining (generating) a gain control signal and using it at the same location (unit) to control two variable gain amplifiers that are producing output signals in two different directions.

With regard to claims 12-15, one aspect of the claimed invention is to devise a methodology that takes into account diverse signal characteristics. This is done by using a state machine, rather than a simple power level calculation. In particular, care is taken to avoid letting the AGC function interfere with the handshake function. Furthermore (see page 23 lines 12-13 of application) the gain control has to be such as "to ensure that the last handshake occurs entirely while the gain is stable." The gain must then be held constant for the entire duration of "showtime" when the CO unit and Subscriber unit are actually exchanging data (user information).

Accordingly, withdrawal of this rejection is respectfully requested.

Claims 1 and 5 were rejected under 35 USC 102(e) as anticipated by Darveau (US 6,236,726). Darveau teaches that to reduce cross-talk, it is advantageous for signals from a plurality of subscriber units, all at varying distances from the Central Office, to arrive at the

Central Office at roughly the same level (see col. 2, lines 42-55). Darveau achieves this goal by estimating what the loss is between the CO and the subscriber unit and from that estimating what the loss would be for the signal going between the subscriber unit and the CO (see col. 8, lines 49-54) (col. 5, lines 41-47). Darveau teaches a conventional AGC unit (86) that is employed to ensure that the level of signal going to the SIGNAL TRANSCEIVER is reasonably a "known" or "fixed" value regardless of the length of the loop (see col. 7, lines 51-55). This is a conventional gain control structure that is well known in the art (for many decades).

Implicit in Darveau's teachings is that the link between the CO and the subscriber is essentially the same as the link going in the other direction. In practice this may not be true. The two directions cannot be assumed to be the "same" when the loop includes a mid-span device such as a repeater/extender that introduces different gain/loss in the two directions of which the subscriber unit is unaware. Darveau is completely silent as to what to do when the AGC function has to be introduced mid-span as in the presently claimed invention. In this situation, estimating the loss from the CO to the repeater/extender has little value in estimating the loss between the subscriber unit and the repeater/extender.

As noted above, independent claim 1 as amended requires "controlling a first gain of said first variable gain amplifier at said mid-span extender unit responsive to said gain control signal; and controlling a second gain of a second variable gain amplifier at said mid-span extender unit responsive to said gain control signal to produce an output signal in a second direction from said second variable gain amplifier at said mid-span extender unit responsive to a second input signal in said second direction from said digital subscriber loop. The presently claimed invention is not disclosed or suggested by Darveau because Darveau does not describe or teach determining (generating) a gain control signal and using it at the same location (unit) to control two variable gain amplifiers that are producing output signals in two different directions.

With regard to claims 12-15, also absent from Darveau's teachings is how to

accommodate the different forms of signal that could occur (such as hand-shake and showtime) and how to ensure that the gain choice is established and held constant from a point in time no later than just preceding the last handshake segment.

With regard to claim 26, in DMT-ADSL, the two directions share the same cable but use different frequency bands. Whereas the subscriber unit of Darveau may estimate the loss incurred by the signal in the downstream frequency band, Darveau does not teach how to translate this loss estimate to an upstream frequency band.

Accordingly, withdrawal of this rejection is respectfully requested.

Claims 18-21, 30-31 and 33-34 were rejected under 35 USC 102(e) as anticipated by Ogawa (US 6,671,502). Claims 18-19, 31 and 33-34 are canceled without prejudice or disclaimer.

Ogawa teaches a conventional automatic gain control (AGC) method that is targeted towards introducing adequate gain/loss such that a particular (output) signal has a "constant" strength (see Ogawa, Abstract), in particular to avoid saturation of the radio repeater device (see col. 4, lines 6-12). One particular feature of Ogawa is that the gain-control is continual.

The presently claimed invention is not disclosed or suggested by Ogawa because Ogawa does not describe or teach a circuit that generates a single gain control signal and, at the same location (unit), automatically controls two variable gain amplifiers that transmit two communications in two different directions.

With regard to claims 12-15, whereas Ogawa teaches the use of a feed-back loop, the claimed invention teaches the use of a state machine to establish the correct gain value.

Accordingly, withdrawal of this rejection is respectfully requested.

Claims 22, 26-27, 32 and 37 were rejected under 35 USC 103 as obvious over Ogawa in view of Lemson. Claims 32 and 37 are canceled without prejudice or disclaimer.

Claim 22 is amended to require two variable gain amplifiers sending output signals in two different directions, both of the variable gain amplifiers being coupled to the same controller; with the gain control signal from the controller being feed back to both variable gain amplifiers for automatic control of both gains (i.e., both of the variable gain amplifiers). Lemson and/or Ogawa simply do not disclose or suggest two variable gain amplifiers in different directions whose gains are both automatically controlled by the same gain control signal.

Claims 26-27 depend from claim 22. Claim 26 specifies that the signal generator includes a discrete multi-tone asymmetric digital subscriber loop transmission unit. Ogawa teaches the use of a detector, 31, to establish the "peak" signal excursion. This Ogawa approach may be fundamentally sound in RF (radio frequency) systems where the signal structure is such that the crest-factor is small, of the order of 3 to 4 dB. However, such an implementation is of little value in a DMT-ADSL system where the crest-factor can be much larger, of the order of 13 to 16 dB (please see the paragraph bridging pages 15-16 of the present specification as originally filed). In the case of DMT-ADSL, the nature of the signal is not stationary. Generally speaking the nature of the signal can be quite varied in terms of power, spectral extent, and crest-factor. There can be times of "quiet" (very low signal), times of "adaptation", and times of "normal operation". The signal structure of DMT-ADSL can be variable between quite extreme conditions and thus a detector, such as 31 of Ogawa, is not appropriate. Claim 27 requires that the transmission medium include an asymmetric digital subscriber loop.

Accordingly, withdrawal of this rejection is respectfully requested.

Claims 28-29, 35-36 and 38-41 were rejected under 35 USC 103 as obvious over Ogawa in view of Lemson and further in view of Schneider et al. (US 6,625,116). Claims 35-36 and 38-41 are canceled without prejudice or disclaimer.

Claims 28-29 depend from claim 22 and additionally require interposing the circuit at an intermediate point of an asymmetric digital subscriber loop between a provider end and a

subscriber end. Schneider does not obviate the above discussed deficiencies of Ogawa and/or Lemson. Therefore claims 28-29 are both allowable by virtue of their dependency from amended claim 22.

Accordingly, withdrawal of this rejection is respectfully requested.

Claim 23 was not rejected or objected to in the office action mailed November 30, 2004. Therefore, applicants have rewritten claim 23 in independent form.

Claim 24 was not rejected or objected to in the office action mailed November 30, 2004. Therefore, applicants have rewritten claim 24 in independent form.

Other than as explicitly set forth above, this reply does not include acquiescence to statements, assertions, assumptions, conclusions, or combination thereof in the Office Action. In view of the above, all the claims are considered patentable and allowance of all the claims is respectfully requested. The Examiner is invited to telephone the undersigned (at direct line 512-394-0118) for prompt action in the event any issues remain that prevent the allowance of any pending claims.

In accordance with 37 CFR 1.136(a) pertaining to patent application processing fees, Applicant requests an extension of time from February 28, 2005 to April 30, 2005 in which to respond to the Office Action dated November 30, 2004. A notification of extension of time is filed herewith.

The Director of the U.S. Patent and Trademark Office is hereby authorized to charge any fees or credit any overpayments to Deposit Account No. 50-3204 of John Bruckner PC.

Respectfully submitted,

John Bruckner PC
Attorney(s) for Applicant(s)

John J. Bruckner
Reg. No. 35,816

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5708 Back Bay Lane
Austin, TX 78739-1723
Tel. (512) 394-0118
Fax. (512) 394-0119

IN THE DRAWINGS:

Please substitute the attached Replacement Sheet(s) for its(their) corresponding drawing sheet(s) in this Application.